

## GPS Metric Tracking Unit



Global Positioning  
System (GPS)  
Metric Tracking

As Global Positioning Satellite (GPS) applications become more prevalent for land- and air-based vehicles, GPS applications for space vehicles will also increase. The Applied Technology Directorate of Kennedy Space Center (KSC) has developed a lightweight, low-cost GPS Metric Tracking Unit (GMTU), the first of two steps in developing a lightweight, low-cost Space-Based Tracking and Command Subsystem (STACS) designed to meet Range Safety's link margin and latency requirements for vehicle command and telemetry data. The goals of STACS are to improve Range Safety operations and expand tracking capabilities for space vehicles. STACS will track the vehicle, receive commands, and send telemetry data through the space-based asset, which will dramatically reduce dependence on ground-based assets. The other step was the Low-Cost Tracking and Data Relay Satellite System (TDRSS) Transceiver (LCT2), developed by the Wallops Flight Facility (WFF), which allows the vehicle to communicate with a geosynchronous relay satellite. Although the GMTU and LCT2 were independently implemented and tested, the design collaboration of KSC and WFF engineers allowed GMTU and LCT2 to be integrated into one enclosure, leading to the final STACS.

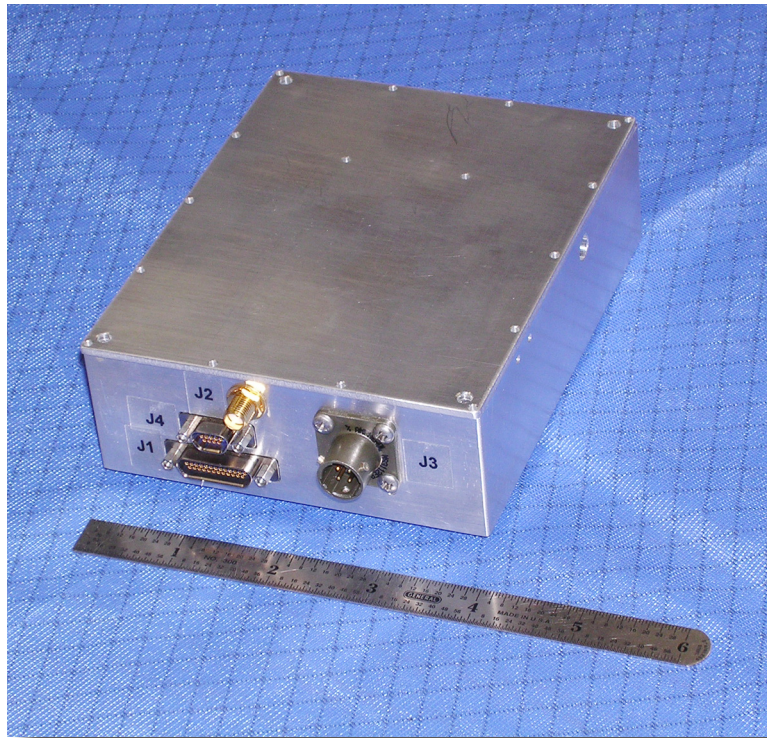
In operation, GMTU needs only a radio frequency (RF) input from a GPS antenna and outputs position and velocity data to the vehicle through a serial or pulse code modulation (PCM) interface. GMTU includes one commercial GPS receiver board and a custom board, the Command and Telemetry Processor (CTP) developed by KSC. The CTP design is based on a field-programmable gate array (FPGA) with embedded processors to support GPS functions. The programmability of the CTP allows designs to be changed and functions to be added without the need to modify the hardware. GMTU is well suited for applications requiring highly reliable metric tracking, such as robotics, autonomous air and ground vehicles, and manned vehicles. GMTU offers two command-receive channels, one output telemetry channel, and Ethernet, serial, and RS-422 interfaces. The unit is conduction-cooled, weighs less than 2 lb, and measures 1.5 by 5.0 by 4.0 inches.

GMTU has passed functional, vibration, and electromagnetic interference testing and is scheduled for flight testing in 2008 aboard a suborbital sounding rocket flight to be launched from WFF. The main objective of the test is to demonstrate the reliability of GMTU to track the rocket and the operational reliability of the hardware.

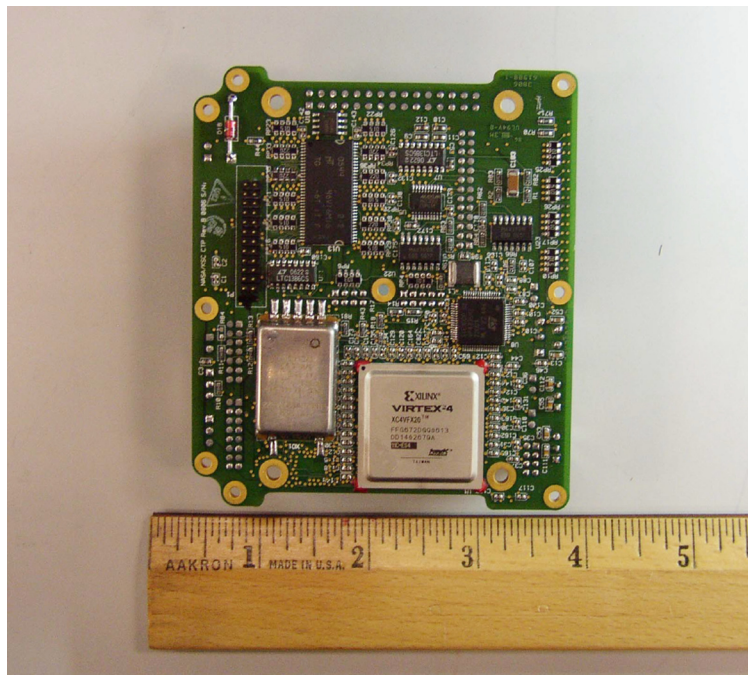
The final step in developing STACS will be to integrate and test the hardware and functional components of GMTU and LCT2.

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*GPS Metric Tracking Unit (GMTU).*



*Command and Telemetry Processor (CTP) board developed at KSC.*